Research Paper | Education | E-ISSN No : 2454-9916 | Volume : 10 | Issue : 4 | April 2024

ACADEMIC ANXIETY SCALE: TOOL DEVELOPMENT AND VALIDATION

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ABSTRACT

The purpose of the paper was to present the process of Academic Anxiety Scale development and validation process. The scale was developed initially with qualitative enquiry followed by exploratory factor analysis, the sub constructs were identified and nomenclature was given. Confirmatory Factor Analysis had been executed for "measurement model" using SEM (AMOS Version.20.0). The value of goodness of fit indices for academic anxiety indicates model is very good fit. Cronbach's alpha reliability coefficients are greater than 0.7 show adequate reliability of the constructs. The Composite Reliability values are greater than 0.63. Items with Average Variance extracted (AVE) of more than 0.50 possesses convergent validity. Variance Explained (VE) value in respect of all constructs is greater than squared correlation of the construct values. Hence, it can be concluded that the research instrument possesses the desired discriminate validity. This clearly shows that the reliability of the tool is well established.

KEYWORDS: Academic Anxiety, Tool Development, Validation

INTRODUCTION

In today's educational setup, students' academic performance is gauged through various means such as grades, teacher evaluations, and self-assessment. It serves as a yardstick to gauge the attainment of educational objectives for both individuals and institutions. Particularly in secondary education, strong academic performance is pivotal as it shapes future educational opportunities and career prospects. Academic performance reflects a student's grasp of school subjects and skills acquired therein. However, creating a conducive environment for positive academic outcomes is hindered by academic anxiety, which often leads to poor academic results and persistent stress among students.

Background of the study

Academic anxiety arises from biochemical processes in the body and brain, enhancing students' attention levels in response to stressful academic situations like assignments, presentations, or exams. Eysenck (2009) notes that academic anxiety contributes to academic struggles by inducing irrelevant thoughts, preoccupation, and diminishing attention and concentration

According to Cassady (2010), academic anxiety is a specific form of anxiety linked to educational settings, encompassing not only test-related anxiety but also concerns about various academic subjects. A moderate level of academic anxiety is beneficial for students as it serves as a motivational force, driving them towards higher academic standards. However, excessive academic anxiety can impede students' performance by disrupting their cognitive processes and hindering their learning journey (Mohd. Shakir, 2014). Failure to address academic anxiety adequately can lead to significant and enduring consequences, including procrastination, poor academic performance, and social withdrawal (Mattoo & Nabi, 2012). It is essential to find the level of academic anxiety among students especially who are appearing for public exams. The article deals with the process of Academic Anxiety Scale developed and validated by L.Arul Suganthi Agnes and P. Muthupandi (2022)/

Academic Anxiety Scale

The researcher searched for standardized measure of Academic Anxiety in Indian scenario. The researcher consulted various standardised scales of measurement to fulfill the aim of the researcher to measure academic anxiety with the sub constructs i.e exam anxiety, classroom anxiety, language usage anxiety, performance anxiety and anxiety towards interaction with teachers, but in absence of such measure compelled the researcher to develop a scale of her own.

Operational Meaning of Constructs

1. Exam Anxiety

Students experience lot of stress and strain before and after an exam more so while appearing the exam. Their every act regarding exam is filled with anxiety, fear and worry which is revealed emotionally. Exam anxiety can create physiological and psychological problems in a person. Psychologically it creates tension, worry, fear and excess anxiety due to fear of failure. Physiologically students may experience stomach upset, excess sweat, faint, shivering etc. The physiological and psychological conditions together leads to mental stress and unable to remember the facts learnt and even creates lot of mental and physical discomforts before taking tests. This exam anxiety is a great barrier in learning and performance Afshan Fatima (2022).

2. Classroom Anxiety

Classroom anxiety is a condition that can affect students of all

ages. Students are afraid of all school encounters and activities. Children are anxious to when the teacher call their name for several reasons. Children used to afraid to enter in to classroom when they fail to complete their home tasks. Sometimes the strict teacher himself/herself terrifies the students. The classroom activities such as unannounced tests, unexpected questions become traumatic. It creates lot of fear towards activities in the classroom and that leads to problems in making friends, speaking in public, or taking tests (SameeraMohiUd Din Dar et.al., 2023).

3. Language Usage Anxiety

Language anxiety is caused mainly due to the fear of communication and humiliation while a learning or using a language that which a student is not confident with. When using a language which is not the individuals' mother tongue and not proficient with the language, there emerges an anxiety called language anxiety (MacIntyre and Gregersen, (2012) sites by Abdullah Alamer, FahadAlmilhim, 2021). Quality interaction between the teacher and the student depends on the degree of anxiety and on how the student perceives the concept while learning. The learning very much depends upon the quality of teacher-student interaction that takes place in the classroom (Krishnan and Hoon, 2002).

4. Performance Anxiety

It means the worry of the students in their ability to perform a task. The learners' fear on their failures in accomplishing a task even before the task is begun. They brood over the chances over humiliation or rejection in case of failures. The students are not much worried about the routine take they do in their school, but when the task is challenging then they experience an anxiety. The Performance Anxiety is fear about one's ability to perform a specific task. The students believe that the failure in a task will put them in humiliation and mockery. Performance anxiety can be prevented by doing what he/she enjoys doing. The teachers can help the students to overcome from the anxiety by motivating, supporting, providing constructive criticism and feedback for the improvement of the students.

5. Anxiety towards interaction with Teachers

Everybody is clear on the basic need of a healthy interpersonal relationship between the teacher and the taught. It includes mutual respect and love which enables the students feels safe and comfortable. The school should cultivate a culture of mutual respect for the teacher and the students that could reduce any language barrier and incubation in the interaction in the school. The teacher should take all the effort to build psychological security and feeling of a sense of belongingness by developing a stress-free environment, helping students relax, creating healthy teacher-student interpersonal behaviour, and promoting self-confidence of students (BekaluAtnafuTaye, 2017).

The Academic Anxiety Scale – Qualitative Enquiry

The academic anxiety scale has to be developed. Hence a triumphant area is needed to be scrutinized. All segments of people in this arena were examined. The students, teachers and the educationalists were consulted for this purpose. The following 40 metrics were generated as a result of the qualitative inquiry.

METRICS GENERATED FROM QUALITATIVE INQUIRY			
Frightened	Nervous	Remember	Bad Feeling
Terrified	Mockery	Feel Confident	Botheration
Stressed	Learning	Engagement	Funk
On time	Errors	Academics	Harmony
Confused	Reluctant	Uneasiness	Solicitude
Panic	Clarify	Afraid	Optimism
Delighted	Heavy Portion	Doubt	Tension
Anxious	Worried	Challenged	Rewards
Interested	Performance	Forgetful	care
Difficult	Happy	Uncertain	Flap

Table No. 1: Metrics Generated from Qualitative Enquiry for AA

An exploratory factor analysis was performed for the above words. Seven factors were derived out of which five factors had Cronbach's Alpha value greater than 0.7 and one miscellaneous factor did not meet the expected value. Hence the sixth factor was dropped. The measures are discussed thoroughly in reliability of the questionnaire. The following detailed table contains information about the initially generated metrics and the resultant grouped metrics from exploratory factor analysis. They were named i.e. nomenclature with coherence to the kind of values it was associated with and they are listed as follows.

S.No.	Initial Metrics	Nomenclature	Grouped Metrics	Notation
1	Frightened		Terrified	A1
2	Terrified		Stressed	A2
3	Stressed		Nervous	A3
4	On time		Forgetful	A4
5	Confused		Confused	A5
6	Learning		On time	A6
7	Anxious		Frightened	A7
8	Afraid		Delighted	A8
9	Worried	Classroom Anxiety	Clarity	B1
10	Heavy Portion		Afraid	B2
11	Reluctant		Learning	B3
12	Uneasiness		Tension	B4
13	Difficult		Uneasiness	B5
14	Solicitude	Language Usage Anxiety	Anxious	C1
15	Nervous		difficult	C2
16	Errors		Remember	C3
17	Panic		Uncertain	C4
18	Clarify		Mockery	C5
19	Uncertain		Interested	C6

20	Performance	Performance Anxiety	Errors	D1
21	Forgetful		Reluctant	D2
22	Engagements		Performance	D3
23	Academics		Doubts	D4
24	Doubts		Heavy Portion	D5
25	Remember		Challenged	D6
26	Interested		Worried	D7
27	Challenged	Anxiety towards Interaction with Teachers	Happy	E1
28	Botheration		Funk	E2
29	Funk		panic	E3
30	Tension		Feel Confident	E4
31	Reward		Bad feeling	E5
32	Care	Unidentified (To be omitted)	Harmony	F1
33	Mockery		Flap	F2
34	Feel Confident		Care	F3
35	Harmony		Optimism	F4
36	Optimism		Botheration	F5
37	Happy		Engagement	F6
38	Flap		Academics	F7
39	Bad feeling		Reward	F8
40	Delighted		Solicitude	F9

Table No. 2: Factors Extracted after Exploratory Factory Analysis

Structural Equation Modeling

SEM is an advanced technique of multiple regressions. SEM has been used mainly for two purposes. The first one is confirmatory factor analysis which has been applied to identify the items of each construct or variable and also evaluate the reliability and validity of each construct. The Structural Equation Modelling, popularly known as (SEM), is a statistical analysis technique developed for analysing the inter-relationships among the multiple variables in a model. The inter-relationships among the variables could be expressed in a series of single and multiple, regression equations Gopinath (2020). It provides opportunity to study the interconnectedness between and among variables selected for the study (Hair et al., 2013). CFA could be organized to find the relationship between the weed or unwanted items and indicators ("measurement items"). This process is called "measurement model" and hypothetical associations among constructs are verified using SEM (Hair et al., 2013).

This approach is as per the recommendation advocated by past research (Anderson & Gerbing, 1988). The 1ststep includes the specification of "measurement model" by the identification of interrelationships amongst observed (indicator) and unobserved (dormant) factors. CFA had been executed for "measurement model" using SEM (AMOS Version.20.0).

Confirmatory Factor Analysis (CFA)/ Measurement Model

Confirmatory factor analysis is the prerequisite for path analysis. In confirmatory factor analysis, the researcher has to check content validity, composite reliability, convergent validity and discriminant validity. Item loadings of each construct have to be more than 0.5 to ensure the content validity (Hair, Black, Babin, Anderson, &Thatham, 2006).The value of AVE (Average Variance Extracted) demonstrates the convergent validity. AVE values for all constructs are equal to or more than 0.5 (Fornell and Larcker, 1981).Confirmatory factor analysis or measurement model for academic anxiety dimensions, exam anxiety, classroom anxiety, language usage anxiety, performance anxiety and anxiety towards interaction with teachers are shown from the figure 1.

Confirmatory Factor Analysis (CFA)/ Measurement Model for Academic Anxiety Scale

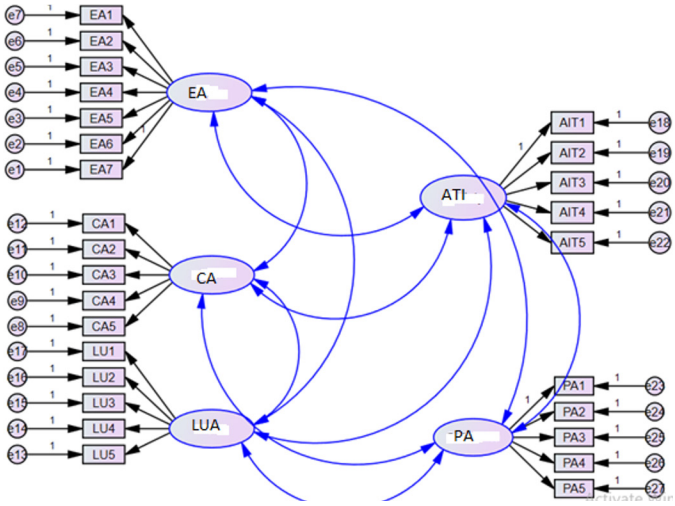

Figure 3.1: CFA for Academic Anxiety Dimensions

EA-Exam Anxiety; **CA-** Classroom Anxiety; **LUA-** Language Usage Anxiety;
PA- Performance Anxiety; **ATI-** Anxiety towards Interaction with Teachers

Construct	(χ2) / df	GFI	AGFI	CFI	NFI	RMSEA
Academic Anxiety	2.82	0.96	0.92	0.90	0.93	0.05
Recommended Value	≤ 3	0.8 ≤ 1	0.8 ≤ 1	0.8 ≤ 1	0.8 ≤ 1	≤ 0.08

Table No. 3: CFA for Academic Anxiety Dimensions

The above table provides details about the value of goodness of fit indices for academic anxiety. Normed Chi square value of 2.82 which is within the prescribed limit indicates model is very good fit. Goodness fit index (GFI) is 0.96 and Adjusted Goodness of fit index (AGFI) of 0.92 indicates that good fit, RMSEA value of 0.05 which is within the range indicating better model fit. CFI and NFI are 0.90 and 0.93 respectively indicating good fit."

Reliability

In the process of tool development the reliability of measurement items was evaluated by examines the consistency of the respondent's answers to all the items in the measure, as recommended (Hair *et al.*, 2013). Cronbach's alpha reliability coefficients were used to measure the internal consistency of each measure, Adam Khatar (2016). Nunnally (1978) suggested that Cronbach's alpha reliability coefficients equal to 0.7 or

greater show adequate reliability. While, Hair *et al.,* (2013) suggested the Cronbach's alpha reliability coefficients of 0.7 or higher indicate adequate internal consistency. Therefore, a minimum cut off value of 0.7 for Cronbach's alpha reliability coefficients was employed in the present research to determine the reliability of each measure in order to find out the overall reliability of the each of the latent constructs used in the model.

Constructs	Indicators	Reliability of Individual Constructs	Source	Composite Reliability of Individual Variables
Exam Anxiety	8	0.780	Developed from EFA	0.73
Classroom Anxiety	5	0.725	Developed from EFA	
Language Usage Anxiety	6	0.719	Developed from EFA	
Performance Anxiety	7	0.785	Developed from EFA	
Anxiety towards Interaction with Teachers	5	0.775	Developed from EFA	

Table No. 4: Assessment of Construct Reliability and Composite Reliability of Variables

Construct Validity

Construct validity denotes the extent to which the constructs used for the study actually measure the intended performance in comparison to the intended measurement standards. It includes the following:

1. Composite Reliability
2. Convergent Validity
3. Discriminate Validity

Composite Reliability

Usually, the Cronbach coefficient is used to assess reliability of survey instrument. Only if the Cronbach reliability value exceeds 0.60, the instrument shall be treated as reliable. On the other hand, it has been observed that Cronbach value does not provide equal weightage to all items in the construct and hence the results of reliability may be biased. Hence, an alternative est of composite reliability needs to be carried out. Composite reliability is computed using the formula

$$\rho_c = \frac{(\sum_{i=1}^{p} \lambda_i)^2 \text{variance } A}{(\sum_{i=1}^{p} \lambda_i)^2 \text{variance } A + \sum_{i=1}^{p} \theta_\delta}$$

Constructs	Indicators	Reliability (α)	Composite Reliability
Exam Anxiety	7	0.680	0.69
Classroom Anxiety	5	0.625	0.63
Language Usage Anxiety	6	0.719	0.73
Performance Anxiety	7	0.685	0.69
Anxiety Towards Interaction With Teachers	5	0.675	0.68

Table No.5: Assessment of Construct Reliability

Results of composite reliability for each construct are shown in Table 5. From the calculation, it is observed that all composite reliability values are greater than 0.63.This clearly shows that the reliability of the tool is well established.

Convergent Validity

Convergent validity indicates the degree to which consistency is accomplished by the measurement instrument across multiple operationalization. Only those variables with convergent validity should be included for study. Items with Average Variance extracted (AVE) of more than 0.50 possesses convergent validity and all other variables should be dropped. AVE is computed using the formula.

$$\text{AVE} = \frac{\sum_{i=1}^{n} L_i^2}{n}$$

Constructs	Indicators	AVE
Exam Anxiety	7	0.59
Classroom Anxiety	5	0.53
Language Usage Anxiety	6	0.63
Performance Anxiety	7	0.59
Anxiety Towards Interaction With Teachers	5	0.58

Table No 6: Convergent Validity

Discriminant Validity

Discriminant validity denotes the independence of the constructs used for the study (Dhevanadhen K. ,Muzaffar Ahmad Sofi (2015). It indicates the degree to which the five constructs used in the study are distinct among themselves. Constructs studied shall be having discriminant validity if the Variance Explained (VE) value of any two constructs exceeds the square of the correlation among the two constructs. Results of square correlation between constructs are shown in Table.

Constructs	VE	Square Correlation
Exam Anxiety	0.595	0.5929
Classroom Anxiety	0.59	0.4589
Language Usage Anxiety	0.53	0.3601
Performance Anxiety	0.46	0.3844
Anxiety towards Interaction with Teachers	0.45	0.5476

Table No. 7: Square Correlation between Constructs

Table 6 depicts that Variance Explained (VE) value in respect of all constructs is greater than squared correlation of the construct values. Hence, it can be concluded that the research

instrument possesses the desired discriminate validity.

CONCLUSION

The article explained the process of Academic Anxiety Scale development process and validation. The scale was developed initially with qualitative enquiry followed by exploratory factor analysis, the sub constructs were identified and nomenclature was given. Confirmatory Factor Analysis had been executed for "measurement model" using SEM (AMOS Version.20.0). The value of goodness of fit indices for academic anxiety indicates model is very good fit. Cronbach's alpha reliability coefficients are greater than 0.7 show adequate reliability of the constructs. The Composite Reliability values are greater than 0.63. Items with Average Variance extracted (AVE) of more than 0.50 possesses convergent validity. Variance Explained (VE) value in respect of all constructs is greater than squared correlation of the construct values. Hence, it can be concluded that the research instrument possesses the desired discriminate validity. This clearly shows that the reliability of the tool is well established.

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